

Claims

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- 3 1. A method, including the steps of
- 4 maintaining a set of access control patterns in at least one associative mem-
- 5 ory;
- 6 receiving a packet label responsive to a packet, said packet label being suf-
- 7 ficient to perform access control processing for said packet;
- 8 matching matchable information, said matchable information being respon-
- 9 sive to said packet label, with said set of access control patterns in parallel, and generat-
- 10 ing a set of matches in response thereto, each said match having priority information as-
- 11 sociated therewith;
- 12 selecting at least one of said matches in response to said priority informa-
- 13 tion, and generating an access result in response to said at least one selected match; and
- 14 making a routing decision in response to said access result.
- 15
- 16 2. A method as in claim 1, including the step of performing at least two
- 17 of said steps of receiving, matching, selecting, and making a routing decision, in parallel
- 18 using a pipeline technique.
- 19
- 20 3. A method as in claim 1, wherein said access control patterns each
- 21 include a bit pattern for matching and a mask pattern of bits not for matching.
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4. A method as in claim 1, wherein said access control patterns each include a set of ternary elements, each representative of a logical "0," logical "1", or "don't care" value.

5. A method as in claim 1, wherein said associative memory includes a hardware content-associative memory having a plurality of rows, each row including one of said access control patterns and one of said access results.

6. A method as in claim 1, wherein said associative memory includes a hardware content-associative memory having a plurality of rows, each row including a bit pattern for matching and one of said access results, and

each row being associated with a pattern of bits not for matching, said set of patterns of bits not for matching being fewer than a number of said rows.

7. A method as in claim 1, wherein said associative memory includes a ternary content-associative memory.

8. A method as in claim 1, wherein said packet label includes a source IP address or subnet, a destination IP address or subnet, a source port, a destination port, a protocol specifier, or an input interface.

1 9. A method as in claim 1, wherein said priority information for each
2 said access control pattern is responsive to a position of said access control pattern in a
3 memory.

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5 10. A method as in claim 1, wherein said priority information includes a
6 position in said associative memory, and said step of selecting includes choosing a first
7 one of said matches.

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9 11. A method as in claim 1, wherein said routing decision includes a
10 committed access rate decision.

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12 12. A method as in claim 1, wherein said routing decision includes an
13 administrative policy decision regarding treatment of said packet.

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15 13. A method as in claim 1, wherein said routing decision includes de-
16 termining an output interface for said packet.

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18 14. A method as in claim 1, wherein said routing decision includes im-
19 plementing a quality of service policy.

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21 15. A method as in claim 1, wherein said routing decision includes per-
22 mitting or denying access for said packet.

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2 16. A method as in claim 1, wherein said step of generating said access
3 result is responsive to a plurality of said at least one matches.
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5 17. A method as in claim 1, wherein said step of matching is performed
6 in order of constant time, whereby said step of matching is performed in time not respon-
7 sive to a number of said access control patterns.
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9 18. A method as in claim 1, wherein said steps of matching and selecting
10 are performed at a rate exceeding 1 megapacket per second.
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12 19. A method as in claim 1, including the step of making a preliminary
13 routing decision for said packet, wherein said packet routing information includes a result
14 of said preliminary routing decision.
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16 20. A method as in claim 19, wherein said preliminary routing decision
17 includes determining at least one output interface for said packet.
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19 21. A method as in claim 19, wherein said packet routing information
20 includes an output interface for said packet.
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22. A method as in claim 1, including the step of preprocessing said packet label to generate said matchable information.

23. A method as in claim 22, wherein said step of preprocessing includes the steps of performing an arithmetic, logical, or comparison operation on said packet label; and generating a bit string for said matchable information in response to said arithmetic, logical, or comparison operation.

24. A method as in claim 22, wherein said step of preprocessing includes the step of comparing a field of said packet label with an arithmetic range or mask value.

25. A method as in claim 22, wherein said step of preprocessing includes the step of comparing a source IP port value or a destination IP port value with a selected port value.

26. A method as in claim 1, including the step of postprocessing said selected match to generate said access result.

27. A method as in claim 26, wherein said step of postprocessing includes accessing a memory in response to a bitstring included in said selected match.

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2 28. A method as in claim 1, wherein said set of access control patterns is
3 responsive to a sequence of access control specifiers, each one of said sequence of access
4 control specifiers declaring whether to permit or deny access for a set of packets.

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6 29. A method as in claim 28, wherein said step of maintaining includes
7 the steps of
8 receiving said sequence of access control specifiers;
9 translating said sequence of access control specifiers into said sequence of
10 access control patterns; and
11 storing said sequence of access control patterns in said associative memory.

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13 30. A method as in claim 29, wherein said step of translating includes
14 the step of generating a plurality of said access control patterns in response to one of said
15 access control specifiers.

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17 31. A method as in claim 29, wherein said step of translating includes
18 the step of generating a single one of said access control patterns in response to a plurality
19 of said access control specifiers.

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